A bi-level voltage control scheme of power systems via automatic zone partitioning

Abstract :

Future power systems should effectively provide a continuous and rapid closed-loop control of system voltage over a broad range of temporal and spatial horizons, and for large deviations from the normal operation. A two-stage voltage control strategy is presented in this paper to reset the reference voltage values ofAVRs ofsynchronous generators, in a coordinated manner, to enhance the voltage profile on a system-wide basis. The power system is partitioned, automatically, into distinct voltage zones of closely coupled buses based on the concept of electrical distance. A pilot bus is then identified in each voltage zone that represents the most sensitive bus, in that zone, for the change ofsystem operating conditions. A distributed control law is developed to control the voltage magnitudes at these pilot buses. The main feature of the developed control is that it abrogates the need for tertiary higher control level, allowing direct interaction between the zone controller and the AVRs in their respective zones. The proposed voltage control scheme is implemented on the IEEE 118 bus under practical system conditions and results are presented